CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

GROUNDWATER SELF-MONITORING PROGRAM

FOR

HEWLETT-PACKARD COMPANY

1501 Page Mill Road Facility
Palo Alto, Santa Clara County

ORDER NO. 94-099

Adopted on August 17, 1994

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

HEWLETT-PACKARD COMPANY
1501 Page Mill Road

GROUNDWATER SELF-MONITORING PROGRAM

A. GENERAL

Reporting responsibilities of waste dischargers are specified in Sections 13225(a), 13267(b), 13268, 13383 and 13387(b) of the California Water Code and this Regional Board's Resolution No. 73-16.

The principal purposes of a monitoring program by a waste discharger, also referred to as self-monitoring program, are: (1) to document compliance with waste discharge requirements and prohibitions established by this Regional Board, (2) to facilitate self-policing by the waste discharger in the prevention and abatement of pollution arising from waste discharge, (3) to develop or assist in the development of effluent or other limitations, discharge prohibitions, national standards of performance, pretreatment and toxicity standards, and other standards, and (4) to prepare water and waste water quality inventories.

B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analyses shall be performed according to the EPA Method 8000 series in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," EPA SW-846 (Rev. 2) dated November 1992; or other methods approved by the Executive Officer of this Regional Board.

C. REPORTS TO BE FILED WITH THE REGIONAL BOARD

1. Violations of Requirements

In the event the discharger is unable to comply with the conditions of the site cleanup requirements and prohibitions due to:

a. Maintenance work, power failures, or breakdown of waste treatment equipment, or

b. accidents caused by human error or negligence, or

c. other causes, such as acts of nature, or

d. poor operation or inadequate system design,

the discharger shall notify the Regional Board office by telephone as soon as he or his agents have knowledge of the incident and confirm this notification in writing within 5 working days of the telephone notification. The written report shall include time, date, and person notified of the incident. The report shall include pertinent information explaining reasons for the noncompliance and shall indicate what steps were taken to prevent the problem from recurring.

2. The discharger shall file a written technical report to be received at least 30 days prior to advertising for bid (or 60 days prior to construction) on any construction project which would cause or aggravate the discharge of waste in violation of requirements; said report shall describe the nature, cost, and scheduling of all action necessary to preclude such discharge.

3. Self-Monitoring Reports

Written reports shall be filed regularly for each calendar quarter (unless specified otherwise) and filed no later than the fifteenth day of the following quarter. The next quarterly report is due October 15, 1994. The reports shall be comprised of the following:

a. Letter of Transmittal:

A letter from the discharger transmitting self-monitoring reports should accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period and actions taken or planned for correcting any requirement violations. If the discharger has previously submitted a detailed time schedule for correcting requirement violations, a reference to this correspondence will be satisfactory. Monitoring reports and the letter transmitting reports shall be signed by a principal executive officer or a duly authorized representative of that person.

The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true and correct.

b. Results of Analyses and Observations

(1) Results from each required analysis and observation shall be submitted in the quarterly self-monitoring regular reports. Results

shall also be submitted for any additional analyses performed by the dischargers at the specific request of the Board. Quarterly water level data shall also be submitted in the quarterly report.

(2) The quarterly reports shall include the groundwater extraction rates from each extraction well, water level data from the extraction wells, the available results of any aquifer tests conducted during the quarter.

(3) The quarterly reports shall include a discussion of unexpected operational changes which could affect performance of the extraction system, such as flow fluctuations, maintenance shutdown, etc.

(4) The quarterly report shall also identify the analytical procedures used for analyses either directly in the report or by reference to a standard plan accepted by the Executive Officer. Any special methods shall be identified and should have prior approval of the Board's Executive Officer.

(5) The discharger shall describe in the quarterly Self-Monitoring Report (SMR) the reasons for significant increases in a pollutant concentration at a well. The description shall include:

a) the source of the increase,

b) how the discharger determined or will investigate the source of the increase, and

c) what source removal measures have been completed or will be proposed.

(6) Original lab results shall be retained and shall be made available for inspection for six years after origination or until after all continuing or impending legal or administrative actions are resolved.

(7) A map or maps shall accompany the quarterly report, showing all sampling locations and plume contours for TCE and benzene to final cleanup levels.

(8) The discharger shall describe in the quarterly monitoring report the effectiveness of the actions taken to regain compliance if compliance is not achieved. The effectiveness evaluation shall include

the basis of determining the effectiveness, water surface elevations and water quality data.

(9) The annual report shall be combined with the fourth quarter regular report and shall include cumulative water quality and water level data for the current year. The annual report shall also include minimum, maximum, mean, and average water quality data for the year, a narative summary of water level data, and analytical results. The report shall contain tabular historical monitoring data and graphical summaries of TCE and benzene data from the extraction wells.

c. SMP Revisions:

Additional long term or temporary changes in the sample collection frequency and routine chemical analysis may become warranted as monitoring needs change. The discharger may submit proposed SMP revisions with the annual SMR.

D. DESCRIPTION OF SAMPLING STATIONS

All existing and future monitoring and extraction wells as appropriate. See Table I and Figure 2 (attached) for monitoring and extraction wells installed at the time of the adoption of this SMP.

E. SCHEDULE OF SAMPLING AND ANALYSES

1. The schedule of sampling and analysis shall be that given in Table I (attached).

2. a. In addition, if a historically undetected EPA Method target compound (according to the analytical schedule presented in Table 1 for each well) is detected in a sample from a well, and the following conditions are met, a second sample shall be taken within two weeks after the results from the first sample are available. These results will be presented either in the SMR for the current quarter or in a supplement to follow the SMR, whichever is practical. The conditions requiring a resampling are as follows:

a) For wells located at the edge of a plume:

i) The historically undetected compound is detected at a concentration at or above one-half the site cleanup standard for the compound; and
ii) The historically undetected compound is not a recognized laboratory contaminant.

b) For all other wells:

i) The historically undetected compound is detected at a concentration at least 10 times the site cleanup standard for the compound; and
ii) The historically undetected compound is not a recognized laboratory contaminant; and
iii) The historically undetected compound is not a common daughter product of detected compounds. Daughter products present expected change, not an unexpected change in the contaminant plume.

This rapid resampling requirement may be waived by RWQCB staff if RWQCB staff decides, based on information presented by the discharger to RWQCB staff within the two week period after the results from the first sample are available, not to require rapid resampling. In this situation, the well would be monitored for the historically undetected compound in the next regular sampling period.

3. Groundwater elevations shall be obtained on a quarterly basis from all wells at the site and submitted in the quarterly report with the sampling results.

4. Well depths shall be determined on an annual basis and compared to the depth of the well as constructed. If greater than ninety percent of screen is covered, the discharger shall clear the screen by the next sampling.

I, Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data and document compliance with site cleanup requirements established in Regional Board Order No. 91-138.

2. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger, and revisions will be ordered by the Executive Officer or Regional Board.

3. Was adopted by the Board on August 17, 1994.

8/17/94
Date

Steven R. Ritchie
Executive Officer

Attachments: Table 1 - Sampling Schedule
Figure 1 -Site Vicinity Map
Figure 2 - Well Location Map

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER 94-099

REVISED SITE CLEANUP REQUIREMENTS FOR:

HEWLETT-PACKARD COMPANY
1501 PAGE MILL ROAD
PALO ALTO
SANTA CLARA COUNTY

STANFORD UNIVERSITY
PALO ALTO
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter Board) finds that:

1. **Site Location and Description** Hewlett-Packard Company operates an electronics research and development facility at 1501 Page Mill Road (PMR) in Palo Alto (Figure 1). Hewlett-Packard has 99 and 51 year leases on the site from Stanford University. The site is composed of ten buildings on a 74 acre site (1501 PMR site) within Stanford Research Park.

2. **Site History** The 1501 PMR site was initially developed from farmland in the late 1950's with the construction of Buildings 1 through 4. Buildings 5, 6, and 6A were constructed in the mid- to late-1960's. The Corporate Gas Station was constructed in the mid-1970s. The HP Corporate Headquarters building (Building 20) was constructed in 1979.

   Past activities at the site included research and development of computing and electronic equipment, manufacturing, and administrative functions. Chemical processes employed at the site included painting and paint stripping, degreasing, machining, plating, chemical milling, storage of solvents and other industrial chemicals, fuel storage and dispensing, and treatment of waste streams from site processes.

   Fourteen metal underground storage tanks (USTs) were installed at the site between 1960 and 1978. All of these tanks have been removed. It is believed that chemicals were released to soil and groundwater from at least five of these tanks. In addition, there may be contaminants in inaccessible areas beneath the buildings.

   Recently Hewlett-Packard has been converting the facility to offices with minimal research and no manufacturing. The site also contains currently used chemical storage sheds.

3. **National Priority List - "Superfund"** On October 15, 1984, the U.S, Environmental Protection Agency (EPA) proposed adding the 1501 PMR site to the National Priority List (NPL), subject to the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). On October 4, 1989, the site was removed from consideration for the NPL (54 Federal Register 41000) in accordance with EPA's Resource Conservation and Recovery Act deferral Policy.

   Pursuant to the South Bay Multi-Site Cooperative Agreement and the South Bay Groundwater Contamination Enforcement Agreement entered into by the Board, EPA and the California Department of Toxic Substances Control (then DHS), the Board has been acting as lead regulatory agency on this site. The Regional Board will continue to regulate the discharger's remediation consistent with CERCLA as amended.

4. **Previous Board Orders** The following orders and permits have been adopted for the Hewlett-Packard 1501 site:

   o Waste Discharge Requirements Order No. 86-22, adopted March 19, 1986
   o Waste Discharge Requirements Order No. 86-94, amending Order No. 86-22
   o Site Cleanup Requirements Order No. 89-81, adopted May 17, 1989
   o Site Cleanup Requirements Order No. 90-89, adopted June 20, 1990
   o Site Cleanup Requirements Order No. 93-92, amending Order No. 90-89

5. **Geology** The majority of the site is immediately underlain by the Santa Clara formation with some areas of alluvium to the north and south. Together, these two stratigraphic formations are divided into seven distinct hydrostratigraphic units. These units are from shallowest to deepest: Alluvium zone, S zone, Gamma A zone, Gamma 1 zone, Gamma 2 zone, Gamma 3 zone and the Gamma 4 zone. Stratigraphic and structural relationships indicate that these seven units are not present at all locations beneath the site. Each unit is differentiated primarily by stratigraphic position, permeability, hydraulic communication and varying amounts of low level, naturally occurring gamma radiation. These units consist of non-marine, semi-continuous deposits of sand and gravel separated by silt and clay. Within these units erosional surfaces exist which have resulted in subtle changes in depositional conditions that in many places have decreased and in others possibly increased vertical permeability of groundwater migration pathways.

   Structurally, the Santa Clara formation has been affected by two features, a fold and a fault. The formation has been deformed into an anticlinal fold whose axis is centered beneath the buildings. The fold, which is coincidental with the site topographic ridge, has resulted in the stratigraphic layers dipping approximately 10 to 20 degrees to the

northeast and 50 degrees to the southwest. The dipping beds have strongly influenced the distribution of contamination. The fault is located approximately 250 feet south of and parallel to the fold axis. The stratigraphy on the south side of the fault is divided into Alluvium and Santa Clara Zones 1 and 2. Unlike the north side of the fault, the south side does not contain enough stratigraphic information to distinguish more than two zones of the Santa Clara formation.

6. **Soil and Source Investigation** Investigations at the site indicate three major source areas and two minor source areas shown on Figure 2 as follows:

Major source areas

The first area is the former main tank cluster source area. This source area has been defined as the area in which soil and groundwater have been impacted by releases of chemicals from at least five former USTs in the area outside Buildings 2 and 4, and in the vicinity of the chemical storage sheds. The primary constituents of concern in the main tank cluster source area soil and groundwater are the volatile organic compounds (VOCs): trichloroethene (TCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (DCE), ethylene dibromide (EDB), benzene, toluene, ethylbenzene, and xylenes. The highest concentrations of these compounds occur in the S and Gamma 1 and 2 Zones but the Gamma 3 and 4 Zones have also been impacted.

The second area is the former tank 1 source area. A former underground waste solvent tank located adjacent to Building 1 is the generally accepted source of chlorinated solvents which have spread to two areas of the site. The first area is on the north side of the groundwater divide north and northwest of Buildings 1 and 2. In this area the Gamma 1, Gamma 2, Gamma 3 and Gamma 4 Zones have been affected both on and off-site with primarily TCE. The second area affected by the tank and/or associated activities is the south side of the groundwater divide southwest of Buildings 1 and 3. Groundwater south of the divide contains primarily TCE and is commingled with the Hillview-Porter regional plume overseen by the California Department of Toxic Substances Control. The Alluvium, Santa Clara 1 and Santa Clara 2 Zones appear to have been affected.

The third area is the former tank 6 source area. The Tank 6 source area originates from former waste solvent tank 6A at the northeastern corner of Building 6A. The constituents of concern originating from this tank are chlorinated solvents, primarily TCE, which were detected at elevated

concentrations in water from the S Zone, Gamma 1, Gamma 2, and Gamma 3 Zones.

Minor source areas

The fourth area is the corporate gas station area located along the east side of the 1501 PMR site adjacent to Hanover Street. Fuel hydrocarbons associated with gasoline storage and dispensing at the station have been detected in soil and groundwater. The chemicals of primary concern in the gas station area are benzene, toluene, xylene and ethylbenzene detected in soil and groundwater. The extent of contamination is limited to the S Zone.

The fifth area is the building subsurface area which is presently covered by Buildings 1 through 6 but contains no known source areas. Investigations of this area have indicated some soil contamination. Groundwater samples around the perimeter of the building indicate there may be contamination that is not correlative with known sources but cannot be investigated further due to access limitations. Cleanup actions discussed below should address groundwater contamination, if there is any, that may originate from beneath the buildings.

7. **Hydrogeology** The distribution of chemicals in the groundwater is directly related to the complex hydrogeology at the site. Generally, the geologic ridge formed by the anticlinal fold and fault forms a hydrologic ridge and causes groundwater to flow in two directions parallel to the topographic surface. Subsurface conditions locally divert groundwater flow to the east and west. The combination of dipping beds, stratigraphic variations, faulting, and topographic relief results in depths to groundwater varying between 25 and 90 feet below ground surface. Groundwater level monitoring and pumping tests have confirmed an upward hydraulic gradient over much of the site and the local vertical and horizontal connection of the hydrostratigraphic units. These data also indicate that the fault can have a groundwater barrier effect. Specific groundwater flow directions are discussed in Finding 8.

8. **Groundwater Investigation** Contaminant distribution in the groundwater is divided into the area north of the groundwater divide (fold/fault) and areas south of the groundwater divide.

North of the divide, the 3 major sources listed above account for the bulk of the groundwater contamination and have merged into one plume. Horizontally, the greatest extent of chemicals extends northeast to beneath the corporate building and

northwest to beneath the HP 1601 California Avenue facility. Vertically, the deepest below the ground surface the chemicals have extended is 275 feet in the Gamma 2 zone at the HP 1601 California Avenue facility. The direction of groundwater flow varies 90 degrees from northwest in the Gamma 1 zone to northeast in the Gamma 3 zone.

On the south side of the divide near the southern property boundary, the contamination is from the tank 1 source area and affects groundwater in three aquifers. The contaminants have moved primarily within the Alluvium and the upper zone of the Santa Clara formation. Horizontally, the south side contaminants have migrated to the former HP Building 28 facility and then onto the Teledyne facility where they merge with chemicals coming from these areas. Vertically, the south side plume extends to 100 feet before it merges with contaminants from the above mentioned facilities. Where the plumes merge, the California Department of Toxic Substances Control is directing the cleanup as part of remedial activities within the Hillview-Porter region. Across the entire 1501 site investigation of groundwater contamination is essentially complete, although minor additional work is needed to confirm and monitor plume configuration as outlined in a July 7, 1994 letter from HP to Board staff.

9. Interim Remedial Actions

Soil excavation for remedial purposes occurred between 1982 and 1986. A total of approximately 100 cubic yards of contaminated soil was removed as part of all tank excavations at the site.

Systems which remove VOCs by vacuum wells have been in operation in the main tank cluster area. These vacuum extraction systems remove VOCs from the soil which could not reasonably be removed by excavation. The systems in the main tank cluster area have removed approximately 5,140 pounds of VOCs since implementation in 1987. The fourth vapor extraction system is located at the corporate gas station area where approximately 1,300 pounds of petroleum hydrocarbons have been removed since implementation in 1989.

Current groundwater extraction and treatment system consists of three extraction wells near the main tank cluster area and four extraction wells located along the southeast side of Page Mill Road.

Since start-up in 1988, approximately 8 million gallons of groundwater have been pumped to remove 1,760 pounds of VOCs by the treatment system.

10. **Baseline Health Risk Assessment** A Baseline Health Risk Assessment (BHRA), dated July 1993, was prepared for the 1501 PMR site to evaluate current and potential future health risks posed by the site. Potential current risks are estimated based on exposures that may be presently occurring. Potential future health risks are based on exposures that potentially could occur in the future if residential development occurs on the site or if untreated groundwater was used for human consumption. To ensure that human health is protected, the BHRA incorporated conservative assumptions. Therefore, it is very unlikely that the actual risks posed by the site would be greater than estimated. Average case and maximum case scenarios are presented in the BHRA. The exposure is based on a 70 year duration. Estimated excess cancer risks for all current land use scenarios range from $4x10^{-8}$ to $9x10^{-6}$ and thus are within or below EPA's range of acceptable risks (between $1x10^{-6}$ (one in one million) and $1x10^{-4}$). These estimated current potential risks include inhalation of indoor air on and off-site that could result from volatilization of chemicals off of groundwater. The highest non-carcinogenic hazard index for potential inhalation of vapor volatilizing off of groundwater was 1.9, which is based on groundwater concentrations at one "hot spot". A hazard index of less than one indicates little potential for non-carcinogenic effects.

Potential future use exposures if no cleanup were to occur could include ingestion of groundwater, inhalation of vapor volatilized from on-site soil and groundwater or inhalation of VOCs from domestic from use of groundwater for showering. Without cleanup, the estimated maximum carcinogenic risk to a future on-site resident (adult or child) from ingestion of groundwater, inhalation of VOCs from the use of groundwater and inhalation of vapor from volatilized soil and groundwater would be $4x10^{-1}$. The highest non-carcinogenic hazard index for ingestion of shallow groundwater and inhalation of VOCs from the use of groundwater would be 419.

Actual future risk may be lower than these estimated potential risk numbers because the assumptions on which these calculations are based may overestimate exposure. For example, these estimated risk calculations assume that the highest chemical concentrations from the entire site area can be found in a single well. Therefore, for most of the plume area, including the off-site areas, the chemical concentrations are much lower than the concentrations used to estimate these risks.

Finally, even using the conservative assumptions used in the BHRA, the actual future risk from exposure to groundwater will be much lower than the estimated risks because HP is currently cleaning up the groundwater.

a. Chemicals of Concern Of the 43 chemicals detected in soil and groundwater during the Remedial Investigation, chemicals of concern are those found to be present in groundwater at concentrations exceeding maximum contaminant levels or detected at concentrations that exceed the upper bound excess carcinogenic risk and/or, exceed non-carcinogenic health based values.

b. Toxicity Classification of Chemicals of Concern The final list of chemicals of concern for target cleanup levels in soil and groundwater have been identified as:

Chemical	class
CARCINOGENS	
benzene	A
carbon tetrachloride	B2
dibromoethane (EDB)	B2
1,4-dichlorobenzene	C
1,1-dichloroethane (1,1-DCA)	C
1,2-dichloroethane (1,2-DCA)	B2
methylene chloride	B2
1,1,2,2-tetrachloroethane	C
tetrachloroethene (PCE)	B2
trichloroethene (TCE)	B2
vinyl chloride	A
NON-CARCINOGENS	
acetone	
1,1-dichloroethene (1,1-DCE)	
cis-1,2-dichloroethene (*cis*-1,2-DCE)	
trans-1,2 dichloroethene (*trans*-1,2 DCE)	
ethylbenzene	
1,1,1-trichloroethane (1,1,1-TCA)	
toluene	
total xylenes	
lead	
mercury	

The EPA categories for carcinogenic classification applied to the chemicals of concern are: A (human carcinogen with sufficient evidence in human epidemiological studies), B2 (probable human carcinogens, with inadequate human evidence and sufficient evidence from animal experiments), and C (possible human carcinogen, limited evidence of carcinogenicity in animals with inadequate human data).

c. **Ecological Assessment** At the HP site, there is little native vegetation or wildlife in the immediate vicinity. Surface water flows into a storm drain system and ultimately to Matadero Creek. Extracted groundwater is treated and discharged to the sanitary sewer. No adverse impacts are expected on aquatic populations in Matadero Creek.

For terrestrial animals or birds, potential impact from exposure to surface water is not expected to be significant due to the nature of the chemicals and those of the species. Bioaccumulation in the food chain is not likely to be significant.

11. **Remedial Investigation / Feasibility Study / and Final Remedial Action Plan** The discharger completed a first draft RI/FS in April 1992. That document was reviewed and comments have been incorporated in a final draft RI/FS dated April 1994. The technical information contained in the RI/FS is consistent with the Health and Safety Code requirements for a final remedial action plan and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requirements for a RI/FS. Regional Board staff have determined that the technical information contained in the Feasibility Study is acceptable for developing a final cleanup plan for the site. The FS contains an evaluation of ARARs, a discussion of interim remedial actions, an evaluation of final remedial actions, and proposed remedial standards. The final Remedial Action Plan for the site will consist of this Order, and the Remedial Investigation/Feasibility Study, and the Regional Board Proposed Plan Fact Sheet.

12. **Adjacent Sites** The 1501 PMR site is surrounded on three sides with research or manufacturing facilities that have or potentially have impacted groundwater. Due to the hydrologic isolation of the top of a topographic and potentiometric high, no significant contaminants have migrated onto the 1501 PMR site from adjacent facilities.

Investigations at the Aydin State Superfund site at 3180 Hanover Street under the oversight of the California Department of Toxic Substances Control have indicated a significant source of VOCs to groundwater. The contamination in the shallow groundwater on the 1501 PMR site near the Aydin site appears to originate from the Aydin site and not from currently identified sources on the 1501 PMR site.

The Hillview-Porter Regional Plume is located along the southern side of the site and is also located within the Stanford Research Park. Adjoining properties include Hewlett-Packard Building 15 and former Building 28, Teledyne MEC and Watkins-Johnson. These sites are overseen by the California Department of Toxic Substances Control. Contaminated groundwater from the 1501 PMR site has moved onto the

Hewlett-Packard Building 28 site and then onto other sites in the Hillview-Porter Region.

13. **Remedial Alternatives** The Feasibility Study identified a range of general response actions and remedial technologies. Three remedial alternatives were developed and evaluated: (1) no action, (2) continuation of current groundwater and soil vapor extraction, and (3) additional groundwater and soil vapor extraction. A complete description of these alternatives is contained in the Feasibility Study.

14. **Summary of Evaluation Criteria** This section summarizes the nine evaluation criteria developed by EPA and used to compare the alternatives in the RI/FS. The alternatives were evaluated in detail with respect to the nine EPA criteria in the RI/FS report. Each alternative was also evaluated with respect to the six state law criteria set forth in Section 25356.1 of the California Health and Safety Code. A comparative analysis was completed in the RI/FS. The nine EPA criteria are:

Overall protection of human health and the environment This criterion addresses whether a remedy provides adequate protection of human health and the environment.

Compliance with applicable or relevant and appropriate requirements (ARARs) This criterion addresses whether a remedy will meet all of the ARARs or other Federal and State environmental laws. ARARs for the site are discussed in detail in the RI/FS.

Long-term effectiveness and permanence This criterion refers to expected residual risk and residual chemical concentrations after cleanup goals have been met and the ability of a remedy to maintain reliable protection of human health and the environment over time.

Reduction of toxicity, mobility or volume This criterion refers to the anticipated performance of the treatment technologies a remedy may employ.

Short-term effectiveness This criterion addresses the period of time needed to achieve cleanup and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

Implementability This criterion refers to the technical and administrative feasibility of a remedy.

Cost This criterion includes estimated capital and operation and maintenance, usually presented in a 30 year present worth format.

Support Agency Acceptance This criterion addresses EPA's acceptance of the selected remedy and any other EPA comments.

Community Acceptance This criterion summarizes the public's general response to the alternatives.

15. **Selected Final Remedy** The selected remedy for the 1501 PMR site is Alternative 3 for the reasons stated in Finding 16. Based primarily on information contained in the discharger's Feasibility Study, this Order provides for a final cleanup plan which is Alternative 3 as follows:

a. Soil The chosen alternative consists of operating the existing four vapor extraction wells in the main tank cluster area, the one well in the corporate gas station area, and three new wells. The new wells will be located in the main tank cluster area to accelerate removal of contaminants in the vadose zone. The soil vapor wells will continue to operate until levels of 1 mg/kg total VOCs are achieved, unless the discharger can demonstrate that a proposed alternative level will be protective of human health and the environment. In addition, when areas beneath existing structures become accessible, additional soil and groundwater characterization and reevaluation of alternatives to meet the 1 ppm total VOC cleanup standard may be required.

b. Groundwater Operation of the current groundwater extraction system will continue with additional wells to capture and treat all contaminated groundwater until drinking water quality is achieved or untill groundwater cleanup standards are modified as described in Findings 17 and 19. Twenty one additional extraction wells will be added to the seven existing extraction wells. The estimated time to achieve groundwater cleanup is unknown. The 30 year present worth cost, as estimated in the RI/FS, is $26.5 million.

Groundwater will be treated and discharged to the sanitary sewer or surface water with an NPDES permit from the Regional Board. Reuse of water will be attempted as much as possible in accordance with Board Resolution 88-160.

Long term monitoring will be required after cleanup levels are achieved. The duration and complexity on the monitoring will be determined at that time.

A deed restriction will be filed by Stanford for the 1501 PMR site prohibiting use of on-site groundwater for drinking water until final cleanup standards are achieved.

16. Remedy Selection Rationale and Statutory Determinations

REJECTED ALTERNATIVES

Alternative 1: No Action for Soil/Groundwater, Groundwater Monitoring Continues.

This alternative has been rejected because it does not comply with ARARs that require active remediation; would not actively reduce toxicity, mobility, or volume of chemicals; and would take a long time to achieve cleanup standards. The BHRA also indicated that there would be no active reduction of risk to acceptable levels at the site.

Alternative 2: Continue Existing Groundwater Extraction and Treatment and Existing Soil Vapor Extraction, Groundwater Monitoring Continues.

This alternative has been rejected because it will not actively remediate all contaminated areas of the site; is not effective in the short term; and does not adequately reduce mobility of contaminants.

ACCEPTED ALTERNATIVE

Alternative 3: Expanded Groundwater Extraction and Treatment and Expanded Soil Vapor Extraction. Groundwater Monitoring Continues.

Overall Protection of Human Health and the Environment

Constituents in groundwater are contained within a defined area and contaminated groundwater is properly treated and released, under permit. Extraction, treatment, and disposal provides for the future protection of human health and the environment.

Compliance with ARARs
The cleanup standard for groundwater is the State or Federal MCL, whichever is more stringent. The goal of this remedial action is to restore groundwater to its beneficial uses.

Long Term Effectiveness

Once chemical concentrations in groundwater and soils are reduced to cleanup standards, potential long-term risks identified in the BHRA are reduced. Treatment residuals are treated and disposed of off-site with appropriate controls in permitted

facilities, thus reducing the potential risk of exposure. Long term management plans include continued groundwater monitoring. The estimated time to reach MCL standards in groundwater is at least 30 years.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Expanded groundwater extraction, treatment, and soil vapor extraction facilities will decrease the volume of the chemicals of concern in the groundwater and the toxicity of the groundwater.

Short Term Effectiveness

Risks of worker exposure to chemicals during system installation and operation are minimal, and safety measures will be implemented. No environmental impacts or potential risks to the community are expected. Short term operation of the groundwater extraction wells will contain the groundwater contamination in a defined area and result in decreased concentrations of the chemicals of concern. Vapor extraction from soils will enhance removal of contaminants and prevent additional groundwater from becoming contaminated. Evaluation of the effectiveness of extraction, treatment, and discharge will occur periodically in accordance with the agency requirements. The time required to achieve cleanup goals has been estimated to be the shortest of the three alternatives.

Implementability

The groundwater extraction, treatment, and discharge alternative is being implemented at the 1501 PMR site. The in-situ soil vapor extraction system can be expanded relatively easily.

Cost

Present value costs for the selected alternative as presented in the RI/FS are $26.5 million over 30 years, which includes installation of the expanded system and operation and maintenance of the entire system.

Support Agency Acceptance

Groundwater and soil vapor extraction, treatment, and discharge will likely be acceptable to all involved agencies.

Community Acceptance

Community response to groundwater extraction and treatment, and soil vapor extraction were considered in choosing the proposed alternative. The community supports this method of treatment.

17. Cleanup Standards The groundwater cleanup standards for the site are U.S. Environmental Protection Agency MCLs, California Department of Health Services MCLs (whichever is lower), or target levels based on risk assessment. Applicable MCL Goals (i.e., greater than zero) are met by the cleanup standards required by this Order. Cleanup to drinking water standards will result in a residual risk that falls within EPA's accepted risk range for carcinogens (excess cancer risk less than $1x10^{-4}$ to $1x10^{-6}$) and non-carcinogens (hazard index less than 1.0).

Groundwater extraction will continue until drinking water quality is achieved, if feasible. If these standards are determined to be infeasible, groundwater extraction shall continue as long as significant quantities of chemicals as determined by the Board, are being removed through groundwater extraction. If drinking water or soil cleanup standards cannot be achieved, the discharger must demonstrate to the satisfaction of the Regional Board that meeting the standards is technically impractical from an engineering perspective and that the alternative proposed will be protective of human health and the environment. The Order will then need to be modified by the Regional Board to allow a less stringent groundwater or soil cleanup level. The soil cleanup standard of 1.0 mg/kg for total VOCs is intended to prevent leaching of VOCs to groundwater, thereby protecting groundwater quality.

18. Risks Associated with Cleanup Standards The selected remedy is protective of human health and the environment - as required by Section 121 of CERCLA - in that pollution in groundwater will be treated to at least Maximum Contaminant Levels (MCLs) and will fall below EPA's acceptable carcinogenic risk range and noncarcinogenic Hazard Index range. EPA considers a carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$ as acceptable. If the noncarcinogenic Hazard Index is less than 1, EPA considers the combined intake of chemicals unlikely to pose a health risk.

The cleanup standards for the 1501 PMR site are protective of human health, have a carcinogenic risk that falls within a range of $1x10^{-4}$ to $1x10^{-6}$, and a Hazard Index of less than 1. The method and assumptions used to obtain the Carcinogenic Risk and Hazard Index associated with the cleanup standards are contained in the RI/FS and the BHRA.

19. **Uncertainty in Achieving Cleanup Standards** The goal of this remedial action is to restore groundwater to its beneficial uses. Based on information obtained during the RI and on a careful analysis of all remedial alternatives, the Board believes that the selected remedy will achieve this goal. However studies at other sites suggest that groundwater extraction and treatment will not be, in all cases, completely successful in reducing contaminants to health based levels in the aquifer zones. The Board recognizes that operation of the selected extraction and treatment system may indicate the technical impracticability of reaching health-based groundwater quality standards using this approach. If it becomes apparent during long term operation of this system, that contaminant levels have ceased to decline and are remaining constant at higher levels than the remedial standards of the data otherwise suggest or that achievement of the standards is technically impracticable or cannot be achieved within a reasonable time frame, the standards and remedy may be reevaluated.

20. **Future Changes to Cleanup Standards** If new information indicates cleanup standards cannot be attained or can be surpassed, the Board will decide if further final cleanup actions, beyond those completed, shall be implemented at this Site. If changes in health criteria, administrative requirements, site conditions, or remediation efficiency occur, the discharger will submit an evaluation of the effects of these changes on cleanup standards as defined in Specification B.3 and B.5.

The Regional Board recognizes that the discharger has already performed extensive investigative and remedial work and that the discharger is being ordered hereby to perform additional remedial tasks. It is in the public interest to have the discharger undertake such remedial actions promptly and without prolonged litigation or the expenditure of public funds. The Regional Board recognizes that an important element in encouraging the discharger to invest substantial resources in undertaking such remedial actions is to provide the discharger with reasonable assurances that the remedial actions called for in this Order will be the final remedial actions required to be undertaken by the discharger. On the other hand, the Regional Board also recognizes its responsibility to protect water quality, public health, and the environment and that future developments could indicate that some additional remedial actions may be necessary.

The Regional Board has considered and balanced these important considerations, and has determined that the remedial actions ordered herein represent the Regional Board's best, current judgment of the remedial actions to be required of the discharger. The Regional Board will not require the discharger to undertake additional remedial actions with respect to the matters previously described herein unless: (1) conditions on the site, previously unknown to the Regional Board, are discovered after adoption of this Order, or (2) new information is received by the

Regional Board, in whole or in part after the date of this Order, and these previously unknown conditions or this new information indicates that the remedial actions required in this Order may not be protective of public health and the environment. The Regional Board will also consider technical practicality, cost effectiveness, State Board Resolution No. 68-16 and other factors evaluated by the Regional Board in issuing this Order in determining whether such additional remedial actions are appropriate and necessary.

21. **Potentially Responsible Party** Results of the Potentially Responsible Party (PRP) search pursuant to the Health and Safety Code Section 25356.1 are that Hewlett-Packard Company is a potentially responsible party associated with the release of pollutants to the subsurface at this location. Stanford University is also a Potentially Responsible Party because it is the owner of the property where the releases have occurred. However, nothing in these findings or Order shall limit the right and ability of these parties to identify other PRPs for the purposes of cost recovery under any applicable laws.

22. **Named Discharger** Hewlett-Packard Company (herein referred to as discharger) is a discharger because of the releases of chemicals that have resulted from its chemical handling facilities. Stanford University (herein referred to as discharger) is a discharger because it is the current owner of the property where these releases have occurred. Stanford University (secondarily responsible) will be responsible for compliance only in the event that Hewlett-Packard Company (primarily responsible) fails to comply with the requirements of this Order, except for Task 13B, for which Stanford is solely responsible.

23. **Non-Binding Allocation of Responsibility (NBAR)** Section 25356.1 of the California Health and Safety Code requires a final remedial action plan (RAP) to include a non-binding allocation of responsibility (NBAR) among all identifiable potentially responsible parties at the site. Any potentially responsible party or combination of parties assigned more than 50% of the liability in the NBAR may seek binding arbitration to allocate the costs of implementing the selected remedy (see Section 25356.3).

24. **Lead Agency** Pursuant to the South Bay Multi-Site Cooperative Agreement and the South Bay Ground Water Contamination Enforcement Agreement, entered into on May 2, 1985 (as subsequently amended) by the Regional Board, EPA and DHS, the Regional Board has been acting as the lead agency. EPA is expected to agree with the remedy selected by the Regional Board. The Regional Board will continue to regulate the dischargers' remediation and administer enforcement actions in accordance with CERCLA as amended by the Superfund Amendments and

Reauthorization Act (SARA), the California Water Code, Health and Safety Code, and regulations adopted thereunder.

25. **Community Involvement** An aggressive Community Relations program has been ongoing for the 1501 PMR site. The Board published a notice in the June 10, 1994 issue of the *Palo Alto Weekly* announcing the proposed final Remedial Action Plan and opportunity for public comment at the Board hearing of June 15, 1994 in Oakland, and announced the opportunity for public comment at an evening community meeting held at Escondido school in Palo Alto on June 21, 1994. A presentation of the proposed final cleanup plan was made at the August 17, 1994 Board hearing and the June 21, 1994 evening community meeting. The 30 day comment period was from June 15 to July 15 1994.

Fact Sheets were mailed to interested residents, local government officials, and media representatives and hand delivered to local neighborhoods. Fact Sheet 1, mailed in September 1989 described the site, the superfund process, and early investigation activities. Fact Sheet 2, mailed in January 1990 revised the schedule for investigation and development of a cleanup plan. Fact Sheet 3 distributed in January 1992 provided an update on the results of the investigation, and described interim cleanup actions. Fact Sheet 4 mailed in October 1992 again provided an update on the site investigation, and interim cleanup actions. It also included a schedule for future investigations and a projected date for completion of the final cleanup plan. Fact Sheet 5, mailed in June 1994, explained the proposed cleanup plan.

26. **State Board Resolution 68-16.** On October 28, 1968, the State Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California". This policy calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses. This is based on a Legislative finding, contained in Section 13000, California Water Code, which states in part that it is State policy that "waters of the State shall be regulated to attain the highest water quality which is reasonable." The original discharge of wastes to the groundwater at this site was contrary to this policy. For purposes of establishing cleanup objectives, the shallow groundwater at the site is designated a potential source of drinking water, and protective levels shall be those levels which have been established as protective for drinking water. At this time it appears that cleanup of groundwater to below the MCLs may be technically impractical due to the difficulties in restoring aquifers to low ppb concentrations. For this reason, the MCL is acceptable to meet the intent of Resolution 68-16.

27. **Regional Board Resolution 88-160**, adopted by the Regional Board, strongly encourages the maximum feasible reuse of extracted groundwater from groundwater pollution remediations either by the discharger or other public or private water users.

    HP completed a study of reuse options at this and other nearby HP sites in November, 1993.

28. **Water Quality Control Plan** The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 17, 1986. The Basin Plan contains water quality objectives and beneficial uses for South San Francisco Bay and contiguous surface and ground waters.

    The existing and potential beneficial uses of the groundwater underlying and adjacent to the facility include:

    a. Industrial process water supply
    b. Industrial service water supply
    c. Municipal and Domestic water supply
    d. Agricultural water supply

29. The discharger has caused or permitted, and threatens to cause or permit, waste to be discharged or deposited where it is or probably will be discharged to waters of the State and creates or threatens to create a condition of pollution or nuisance.

30. This action is an order to enforce the laws and regulations administered by the Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.

31. The Board has notified the discharger and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.

32. Pursuant to Section 13304 of the Water Code, the discharger(s) is (are) hereby notified that the Board is entitled to, and may seek reimbursement for, all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order.

33. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, pursuant to Section 13304 of the California Water Code, and Section 25356.1 of the California Health and Safety Code, that the discharger shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous materials in a manner which will degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.

2. Further significant migration of pollutants through subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of pollutants are prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil or groundwater containing pollutants shall not create a nuisance as defined in Section 13050(m) of the California Water Code.

2. The discharger shall conduct monitoring activities as determined by the Executive Officer and, should monitoring results show evidence of further plume migration beyond that already identified, additional characterization of the pollutant plume may be required.

3. Groundwater cleanup standards, set forth in Table 1, shall be met in all wells identified in the Self Monitoring Program.

4. The discharger shall implement the final cleanup plan described in Finding 16.

5. The soil cleanup standard is 1 ppm for total VOCs, unless a higher alternative level is demonstrated to be protective of human health and the environment, or more stringent standards are required for protection of human health and the environment.

C. PROVISIONS

1. The discharger shall comply with the attached Self-Monitoring Program.

2. The discharger shall comply with the Prohibitions and Specifications above immediately except as modified by the time schedule and tasks listed below.

a. **COMPLETION DATE: December 1, 1994**

TASK 1: GROUNDWATER REUSE AND RECLAMATION: Submit a technical report acceptable to the Executive Officer containing the groundwater reuse and reclamation plan for the treated groundwater. The report shall expand on reports that have been completed for facilities in the area but must be specific for the well placement proposed in the FS, include documentation of efforts to reuse the water, efforts to secure the use for the water, and reasons why potential users would not accept the water and discuss the technical feasibility.

b. **COMPLETION DATE: July 1, 1995**

TASK 2: INSTALLATION OF ADDITIONAL MONITORING WELL(S): Submit a technical Report acceptable to the Executive Officer documenting collection of additional groundwater information and installation of the remaining groundwater monitoring well(s) needed to assess the effectiveness of the groundwater extraction system, confirm the vertical and lateral distribution of the current groundwater plume, and monitor the future changes in plume dimensions as identified in the July 7, 1994 letter from HP to Board staff.

c. **COMPLETION DATE: December 1, 1994**

TASK 3: INSTALLATION OF EXPANDED GROUNDWATER EXTRACTION AND TREATMENT SYSTEM
Submit a workplan and time schedule acceptable to the Executive Officer for installation of the expanded groundwater extraction system as outlined in the FS and evaluation of capture area. The workplan shall contain the final construction schedule for the time period from adoption of this Order through submittal of the start up report, the as built construction drawings of the entire system, and the first two weeks of monitoring data.

d. **COMPLETION DATE:** **According to a schedule set in the above Task approved by the Executive Officer.**

TASK 4: EVALUATE CAPTURE AREA OF IMPACTED GROUNDWATER AND PROPOSE ADDITIONAL EXTRACTION WELLS IF NECESSARY Submit a technical report acceptable to the Executive Officer documenting implementation of the expanded groundwater extraction system and containing an evaluation of the capture zones of all groundwater extraction systems related to the 1501 PMR site remediation. The capture zones must affect all on- and off-site contaminated groundwater that originates from the site. This evaluation must also propose additional extraction wells, if necessary, and an implementation schedule.

e. **COMPLETION DATE:** **According to a schedule set in the above Task approved by the Executive Officer.**

TASK 5: START-UP OF MODIFICATIONS TO GROUNDWATER EXTRACTION AND TREATMENT SYSTEM: Submit a technical report acceptable to the Executive Officer documenting completion of any modifications identified in the above Task.

f. **COMPLETION DATE:** **90 days prior to proposed curtailment of any groundwater extraction well or treatment system.**

TASK 6: GROUNDWATER WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from any groundwater extraction well(s) and the criteria used to justify such curtailment. This report shall include data to show that groundwater cleanup standards for all VOCs have been achieved and that pollutant levels have stabilized or are stabilizing, and that the potential for pollutant levels rising above cleanup standards is minimal. Curtailment of groundwater extraction may include but is not limited to: final shutdown of the system (i.e. elimination of pumping in selected wells) , a phased approach to shutdown, pulsed pumping, or a significant change in pumping rates. The report shall identify the basis for the time frame to be used to confirm that groundwater concentrations have stabilized at or below final cleanup standards and that the potential for increases above cleanup standards is minimal.

If the proposal is a modification to the extraction and treatment system, it is subject to approval by the Executive Officer. If the proposal is substantive curtailment of the entire site extraction system, it is subject to approval by the Board.

If the discharger claims that it is not practicable to achieve cleanup standards through continued groundwater extraction in all or any portion of the groundwater plume area, the discharger shall evaluate the reductions in chemical concentrations, the mass quantities being removed through groundwater extraction, and alternative cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving cleanup standards, whether meeting the cleanup standards is technically impracticable, cost effectiveness, and whether the alternative cleanup standard proposed will be protective of human health and the environment.

g. **COMPLETION DATE: 60 days after the Board approves curtailment**

TASK 7: IMPLEMENTATION OF GROUNDWATER EXTRACTION CURTAILMENT: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for the above task.

h. **COMPLETION DATE: December 1, 1994**

TASK 8: INSTALLATION OF EXPANDED SOIL VAPOR EXTRACTION AND TREATMENT SYSTEM Submit a workplan and time schedule acceptable to the Executive Officer for installation of the expanded soil vapor extraction system. This workplan shall contain the final construction schedule from the time period from adoption of this order through submittal of the start up report, as built construction drawings of the system, and the first two weeks of monitoring data.

i. **COMPLETION DATE: According to the schedule in the above Task approved by the Executive Officer.**

TASK 9: EVALUATE EFFECTIVENESS OF SOIL VAPOR EXTRACTION SYSTEM Submit a technical report acceptable to the Executive Officer which documents implementation of the expanded SVE system, evaluates effectiveness of the entire soil vapor extraction system, and proposes modifications to the system, if necessary, to accomplish the cleanup

standard. This evaluation should include data from soil vapor monitoring devices installed to assess the effectiveness of the soil vapor extraction system.

j. **COMPLETION DATE:** **According to the schedule in the above Task approved by the Executive Officer.**

TASK 10: START-UP OF MODIFICATIONS TO SOIL VAPOR EXTRACTION SYSTEM: Submit a technical report acceptable to the Executive Officer documenting completion of modifications identified in the above Task.

k. **COMPLETION DATE:** **60 days prior to proposed curtailment of any soil vapor extraction well or treatment system.**

TASK 11: SOIL VAPOR WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from any soil vapor extraction systems and the criteria used to justify such curtailment. If the reason for curtailment is achievement of final cleanup standards then the report shall include a proposal indicating the methods of determining concentrations of VOCs remaining in the soil. The proposal may include temporary termination of extraction well operation for an extended period of time to study the effects on chemical migration prior to well abandonment. The proposal shall include a schedule for implementation.

If the discharger claims that it is not practicable to achieve cleanup standards through continued soil vapor extraction in all or any portion of the contaminated soil area and that significant quantities of chemicals are not being removed through soil vapor extraction, the discharger shall evaluate the reductions in chemical concentrations and alternative cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving cleanup standards, whether meeting the cleanup standard is technically impracticable, cost effective, and whether the alternative cleanup standard proposed will be protective of human health and the environment.

l. **COMPLETION DATE:** **According to the schedule in the above Task approved by the Executive Officer.**

TASK 12: IMPLEMENTATION OF CURTAILMENT AND COMPLETION OF SOIL REMEDIATION: Submit a technical report

acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for the above task. Include the results of any chemical analysis performed.

m. **COMPLETION DATE: March 1, 1995**

TASK 13A : PROPOSED CONSTRAINTS: Hewlett-Packard Company shall submit a technical report acceptable to the Executive Officer documenting institutional constraint procedures to be implemented by Hewlett-Packard Company to prevent exposure of on-site workers or employees to chemicals found in on-site soil and groundwater, including the use of the contaminated groundwater as a source of drinking water. Constraints shall remain in effect until groundwater cleanup standards have been achieved and pollutant levels have stabilized in the aquifers beneath the site.

TASK 13B: PROPOSED CONSTRAINTS: Stanford University shall submit a technical report acceptable to the Executive Officer documenting procedures to implement a deed restriction for the 1501 PMR site to be prepared and filed by Stanford University prohibiting the use of on-site contaminated groundwater as a source of drinking water. The deed restriction must also prohibit residential use of areas with soil contamination until a risk assessment is completed which determines the soil cleanup standards that are protective of residential use. The Executive Officer may approve an alternative mechanism if it accomplishes the same function as a deed restriction. Constraints shall remain in effect until groundwater cleanup standards have been achieved and pollutant levels have stabilized in the aquifers beneath the site.

n. **COMPLETION DATE: 60 days after Executive Officer's approval of above task.**

TASK 14: IMPLEMENT CONSTRAINTS: Stanford University and Hewlett-Packard Company, as applicable, shall each submit a technical report acceptable to the Executive Officer documenting that the proposed and approved constraints have been implemented.

o. **COMPLETION DATE: December 1, 1999**

TASK 15: FIVE YEAR STATUS REPORT AND EFFECTIVENESS EVALUATION: Submit a technical report acceptable to the Executive Officer containing the results of any additional investigation; an evaluation of the effectiveness of installed final cleanup measures and cleanup costs; additional

recommended measures to achieve final cleanup objectives and standards, if necessary; and projected costs necessary to achieve cleanup objectives and standards; and the tasks and time schedule necessary to implement any additional final cleanup measures. This report shall also describe the reuse of extracted groundwater and evaluate and document the cleanup of contaminated groundwater. If cleanup standards in this Order have not been achieved on-site and are not expected to be achieved through continued groundwater extraction and/or soil remediation, this report shall also contain an evaluation addressing whether it is technically practicable to achieve the cleanup standards, and if so, a proposal for procedures to do so. If the discharger believes that it is not practical to achieve cleanup standards through continued groundwater extraction in all or any portion of the site, the report may evaluate alternative cleanup standards.

p. **COMPLETION DATE: 90 days after request made by the Executive Officer**

TASK 16: EVALUATION OF NEW HEALTH CRITERIA: Submit a technical report acceptable to the Executive Officer which contains an evaluation of how the final plan and cleanup standards would be affected, if the groundwater or soil cleanup values listed in Table 1 or specification B5 of this Order change as a result of promulgation of drinking water standards, maximum contaminant levels or action levels or other health based criteria.

q. **COMPLETION DATE: 90 days after request made by the Executive Officer**

TASK 17: EVALUATION OF NEW TECHNICAL INFORMATION: Submit a technical report acceptable to the Executive Officer that documents an evaluation of new technical and economic information which indicates that cleanup standards or cleanup technologies in some areas may be considered for revision. Such technical reports shall not be required unless the Executive Officer or the Board determines that such new information indicates a reasonable possibility that the Order may need to be changed under the criteria described in Findings 17, 19 and 20.

3. The submittal of technical reports evaluating final remedial measures will include a discussion of the cost, effectiveness, and impact on human health and the environment with the guidance provided by Subpart F of the NCP (40 CFR Part 300); Section 25356.1(c) of the California Health and Safety Code; CERCLA guidance documents; and shall be consistent with the State Water

Resources Control Board's Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California."

4. If the discharger is delayed, interrupted or prevented from meeting one or more of the completion dates specified in this order, the discharger shall promptly notify the Executive Officer, and the Board may consider revision to this Order for such delays that are beyond the control of the discharger.

5. Technical status reports on compliance with the Prohibitions, Specifications, and Provisions of this Order shall be submitted quarterly to the Board commencing on October 15, 1994, and covering the previous calendar quarter. Reports shall be submitted on a quarterly basis, until one year after implementation of the expanded groundwater extraction and treatment system. The technical reports may then be submitted semi-annually after the second and fourth quarters thereafter, or as required by the Executive Officer. These reports shall consist of: (1) a summary of work completed since submittal of the previous report and work projected to be completed by the time of the next report, (2) identification of any obstacles which may threaten compliance with the schedule of this Order and what actions are being taken to overcome these obstacles, and (3) include, in the event of non-compliance with any Provision or Specification of this Order, written notification which clarifies the reasons for non-compliance and which proposes specific measures and a schedule to achieve compliance. This written notification shall identify work not completed that was projected for completion, and shall identify the impact of non-compliance on achieving compliance with the remaining requirements of this Order.

   These reports shall also identify any problems with or changes in the extraction and treatment system. Additionally, the reports shall include, but not be limited to, updated water table and piezometric surface maps and TCE and benzene plume maps for all affected water-bearing zones, and appropriately scaled and detailed base maps showing the location of all monitoring wells and identifying adjacent facilities and structures. These reports may be combined with quarterly SMRs required per Provision C.1.

6. On an annual basis beginning with the report due January 31, 1996, or as required by the Executive Officer, the status report shall include an evaluation of the progress of cleanup measures such as hydraulic control of the plume, performance of the remedy, estimation of capture zones influenced by extraction wells, establishment of cone of depression using field data, and a summary of water quality data. The report shall also evaluate the effects of

operation of existing extraction wells on groundwater levels and an estimate of the amount of chemicals removed via the extraction systems. These reports

may be combined with quarterly SMRs required in Provision C.1. No such report needs to be filed in 1999.

7. Non Binding Allocation of Responsibility (NBAR) . The cost of implementing the selected remedy should be allocated to Hewlett-Packard (100%) and Stanford University (0%).

8. All technical reports or technical documents shall be signed by or stamped with the seal of a registered geologist, engineering geologist, or professional engineer.

9. All samples shall be analyzed by State certified laboratories or laboratories accepted by the Board using approved EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control records for Board review.

10. The discharger shall maintain in good working order, and operate, as efficiently as possible, any facility or control system installed to achieve compliance with the requirements of this Order.

11. The discharger shall provide copies of all correspondence, reports, and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order to the Santa Clara Valley Water District and California EPA/DTSC Site Mitigation Branch.

12. The discharger shall permit the Board or its authorized representative, in accordance with Section 13267(c) of the California Water Code:

    a. Entry upon premises in which any pollution sources exist, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

    b. Access to copy any records required to be kept under the terms and conditions of this Order.

    c. Inspection of any monitoring equipment or methodology implemented in response to this Order.

d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.

13. The discharger(s) shall be liable, pursuant to Section 13304 of the Water Code, to the Board for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects therof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to procedures established in that program. Any disputes raised by the discharger over the reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures of that program.

14. If any hazardous substance, as defined in the California Water Code Section 13050, discharged in or on any waters of the State, or discharged and deposited where it is, or probably will be discharged in or on any waters of the State, the discharger shall report such discharge to this Board, at (510) 286-1255 on weekdays during office hours from 8:00 a.m. to 5:00 p.m., and to the Office of Emergency Services at (800) 852-7550 during non-office hours. A written report shall be filed with the Board within five working days and shall contain information relative to: the nature of the waste or pollutant, quantity involved, duration of incident, cause of spill, estimated size of affected area, nature of effects, corrective measures that have been taken or planned, and scheduled of these activities, and persons notified.

15. The discharger shall file a report on any changes in site occupancy and ownership associated with the facility described in this Order.

16. The Board will review this Order periodically and may revise the requirements when necessary.

17. Board Order Nos. 90-89 and 93-092 are hereby rescinded.

I, Stephen R. Ritchie Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on August 17, 1994.

Steven R. Ritchie
Executive Officer

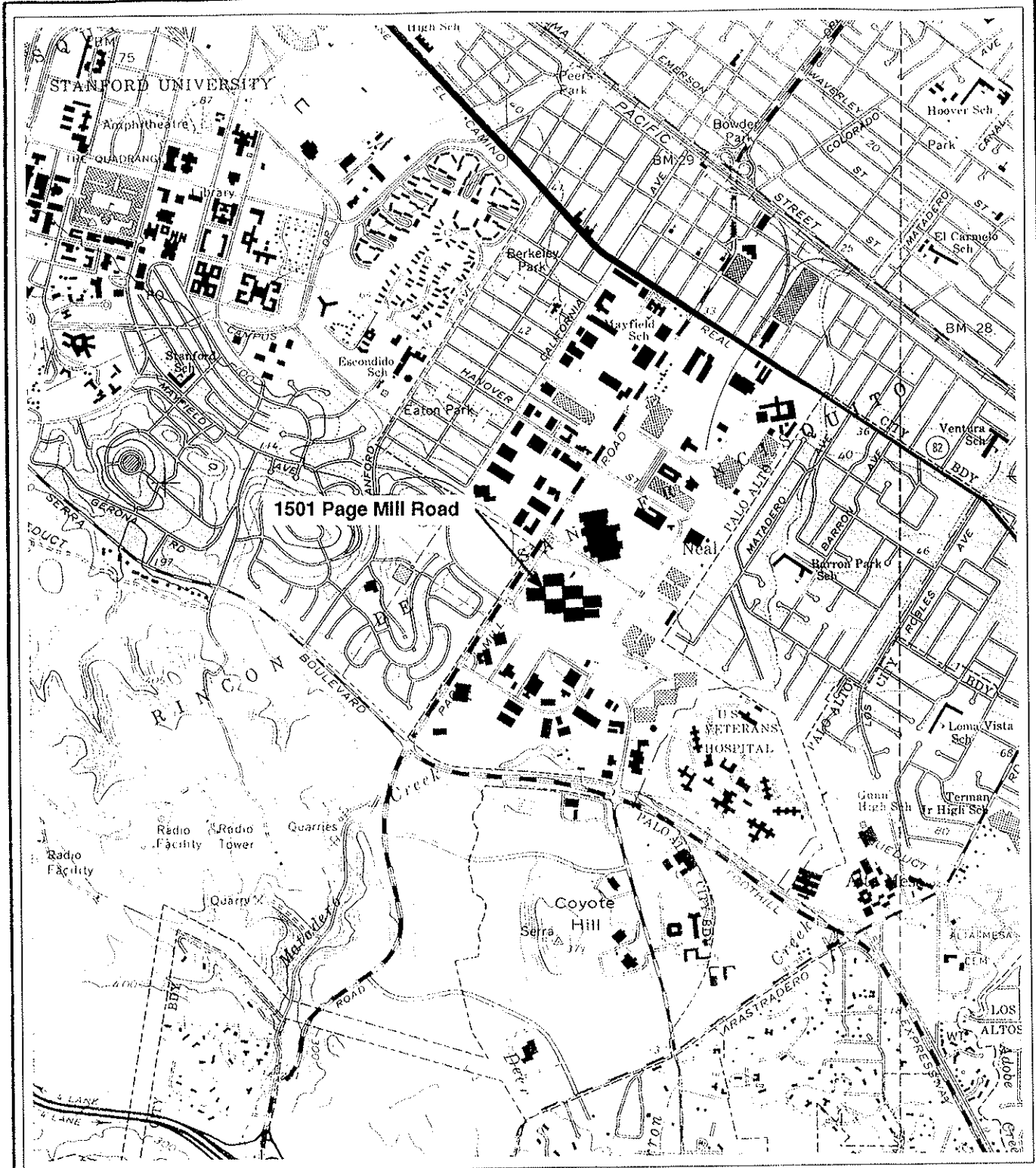
Attachments:

Self Monitoring Program
Figure 1 - Site Vicinity Map
Figure 2 - Well Locations Map
Table 1 - Groundwater Cleanup Standards

TABLE 1
SITE CLEANUP REQUIREMENTS
GROUNDWATER CLEANUP STANDARDS
HEWLETT-PACKARD 1501 PAGE MILL ROAD

CHEMICAL	CLEANUP STANDARD ug/L
Acetone	3,500
Benzene	1
Carbon Tetrachloride	0.5
Ethylene Dibromide	0.02
1,4-Dichlorobenzene	5
1,1-Dichloroethane	5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	6
trans-1,2-Dichloroethene	10
Ethylbenzene	680
Methylene Chloride	5
1,1,2,2-Tetrachloroethane	1
Tetrachloroethene	5
Toluene	1,000
1,1,1-Trichloroethane	200
Trichloroethene	5
Vinyl Chloride	0.5
Total Xylenes	1750
Lead	50
Mercury	2

For all chemicals except Acetone, cleanup standards for groundwater are federal or state MCL's, whichever is lower. For acetone, there is no federal or state MCL and the cleanup standard is based on the EPA reference dose and a hypothetical maximum exposure rate.



REFERENCE: USGS 7.5 Minute Quadrangle, Palo Alto, California, 1973.

0 1200 Feet

0 1/2 Mile

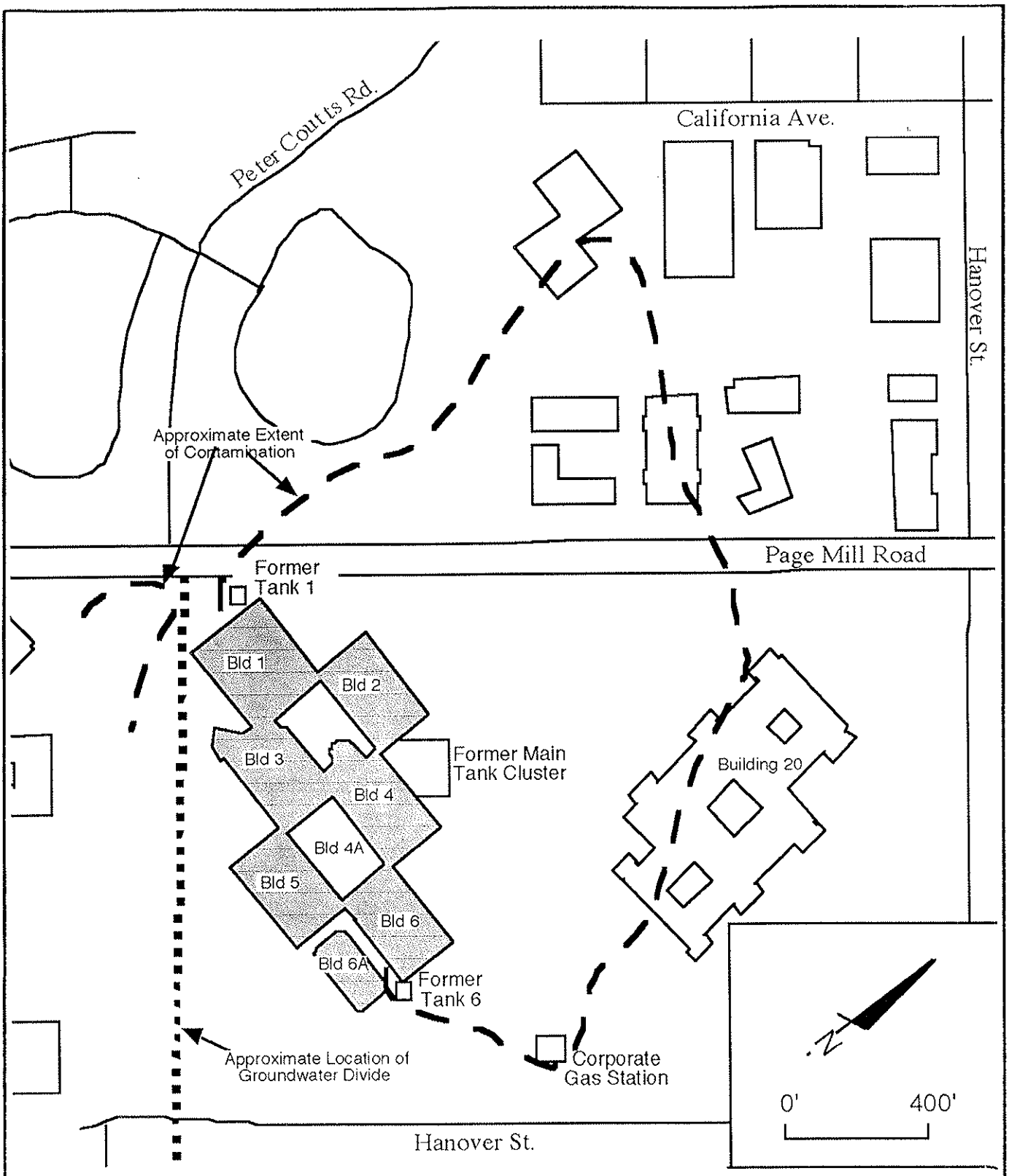
N

DAMES & MOORE

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

Hewlett-Packard 1501
Page Mill Road
Palo Alto
SCR Figure 1 Site Vicinity

DRAWN BY: jmh	DATE: 8/17/94	DRWG. NO. 1



STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

Hewlett-Packard 1501
Page Mill Road
Palo Alto
SCR Figure 2 Site Detail

DRAWN BY:	DATE: 8/17/94	DRWG. NO. 2

TABLE 1
SELF MONITORING PROGRAM
SAMPLING SCHEDULE
HEWLETT-PACKARD 1501 PAGE MILL ROAD
MONITORING AND EXTRACTION WELLS

MONITORING WELL NUMBER	SAMPLING FREQUENCY	ANALYSIS, BY EPA METHOD OR METAL
MW-4	Q	8010
MW-5	Q	8010
MW-6	Q	8010
MW-10	Q	8010
MW-15	Q	8010, 8020, Pb, Hg
MW-18	SA	8010, 8020
MW-20	Q	8010, 8020, Pb, Hg
MW-27	Q	8010, 8020
MW-31	SA	8010, 8020
MW-48	Q	8010, 8020
MW-49	SA	8010, 8020
MW-50	Q	8010, 8020, Pb, Hg
MW-62	SA	8010, 8020
MW-63	Q	8010
MW-64	Q	8010
MW-65	Q	8010
MW-66	A	8010
MW-68	A	8010
MW-70	Q	8010
MW-71	SA	8010
MW-76	A	8010
MW-79	Q	8010, 8020
MW-83	SA	8010

TABLE 1
SELF MONITORING PROGRAM
SAMPLING SCHEDULE
HEWLETT-PACKARD 1501 PAGE MILL ROAD
MONITORING AND EXTRACTION WELLS

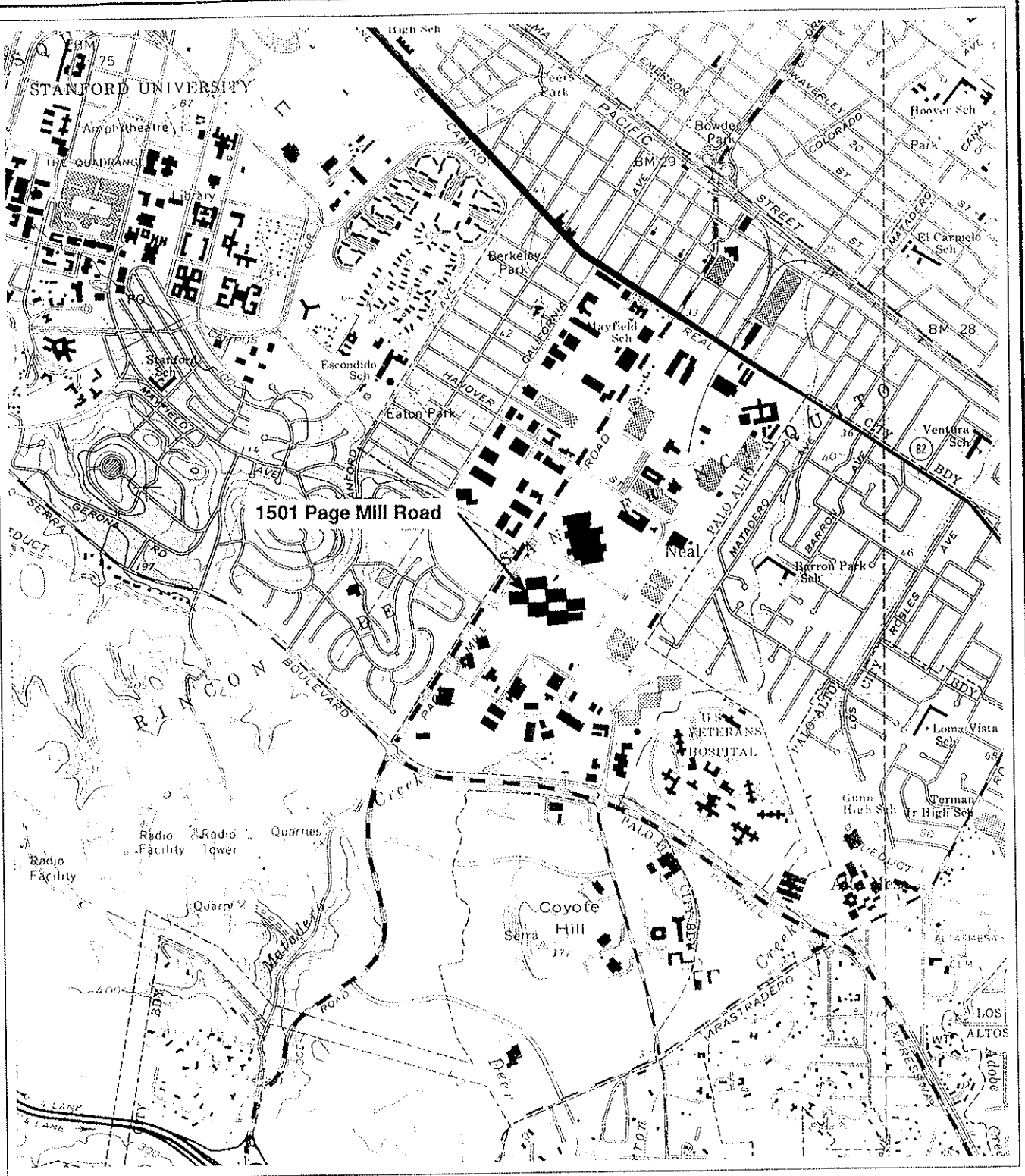
MONITORING WELL NUMBER	SAMPLING FREQUENCY	ANALYSIS, BY EPA METHOD OR METAL
MW-85	Q	8010
MW-86	SA	8010
MW-88	Q	8010, 8020
MW-90	Q	8010
MW-91	Q	8010
MW-94	SA	8010
MW-95	SA	8010
MW-96	Q	8010
MW-99	Q	8010
MW-102	SA	8010
MW-103	SA	8010
MW-104	SA	8010
MW-105	Q	8010
MW-109	A	8010
MW-111	SA	8010
MW-112	SA	8010
MW-114	SA	8010
MW-116	Q	8010
MW-117	Q	8020
MW-118	A	8010
MW-120	Q	8010
MW-124	Q	8010
PZ-125	Q	8010

TABLE 1
SELF MONITORING PROGRAM
SAMPLING SCHEDULE
HEWLETT-PACKARD 1501 PAGE MILL ROAD
MONITORING AND EXTRACTION WELLS

MONITORING WELL NUMBER	SAMPLING FREQUENCY	ANALYSIS, BY EPA METHOD OR METAL
PZ-126	SA	8010
MW-130	SA	8010
MW-134	SA	8010
MW-135	Q	8010
MW-136	SA	8010
MW-137	SA	8010
MW-140	SA	8010
MW-142	Q	8010
MW-143	A	8010
MW-145	Q	8010
MW-146	Q	8010
MW-150	Q	8010, 8020, Pb, Hg
MW-153	Q	8010
MW-154	Q	8010
MW-155	Q	8010
MW-163	Q	8010
MW-164	Q	8010

EXTRACTION WELL NUMBER	SAMPLING FREQUENCY	ANALYSIS, BY EPA METHOD OR METAL
MW-28	A	8010
MW-29	A	8010, 8020, Pb, Hg
MW-30	SA	8010
MW-84	A	8010
MW-97	SA	8010
MW-119	SA	8010
MW-121	A	8010
MW-127	A	8010
EW-1	A	8010, 8020
EW-2	A	8010, 8020
EW-3	A	8010
EW-5	A	8010
EW-6	A	8010
EW-7	A	8010

Q = quarterly, SA = semi-annually, and A = annually.



REFERENCE: USGS 7.5 Minute Quadrangle, Palo Alto, California, 1973.

0 1200 Feet

0 1/2 Mile

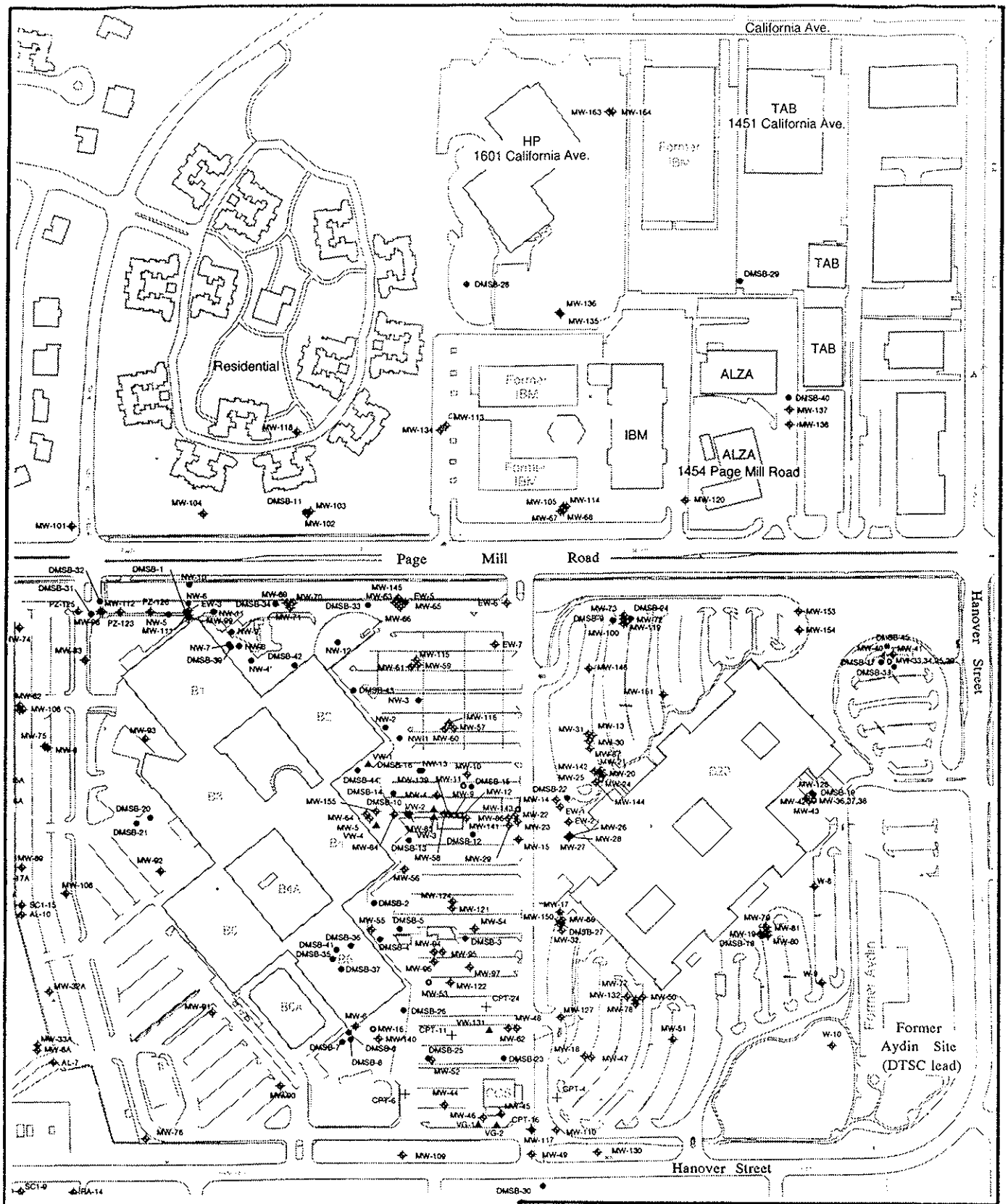
N

DAMES & MOORE

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

Hewlett-Packard 1501
Page Mill Road
Palo Alto
SMP Figure 1 Site Vicinity

DRAWN BY: jmh	DATE: 8/17/94	DRWG. NO. 1



Monitoring Well, Piezometer, or Groundwater Extraction Well

Soil Boring

Cone Penetrometer Test (Converted to Soil Boring)

Vapor Well

Abandoned Well

N

0 350

Scale in Feet

DAMES & MOORE

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

Hewlett-Packard 1501 Page Mill Road Palo Alto

SMP Figure 2 Well locations

DRAWN BY: jmh	DATE: 9/21/94	DRWG. NO. 2